$$\frac{i}{C\omega_0 U_m} = \cos(\omega_0 t + \varphi) \quad ②$$

① ² + ② ² donnent : $\frac{u_C^2}{U_m^2} + \frac{i^2}{C^2\omega_0^2 U_m^2} = 1$

$$u_C^2 + \frac{i^2}{C^2\omega_0^2} = U_m^2$$

4) a- $E_e = \frac{1}{2} C u_C^2 = \frac{1}{2} C U_m^2 \sin^2(\omega_0 t + \varphi) = \frac{1}{4} C U_m^2 \left[1 - \cos(2\omega_0 t + 2\varphi)\right]$

b- $E_m = \frac{1}{2} L i^2 = \frac{1}{2} L C^2 U_m^2 \omega_0^2 \cos^2(\omega_0 t + \varphi)$

$$E_m = \frac{1}{4} C U_m^2 \left[1 - \cos(2\omega_0 t + 2\varphi)\right]$$

c- $E_{em} = E_m + E_m = \frac{1}{2} C U_m^2$

Comme C = C^te et U_m = C^te => E = C^te

$$E_{em} = \frac{1}{2} 15.10^{-6} \times 12^2 = 1,08.10^{-3} \text{ J}$$

D'où l'énergie électromagnétique se conserve.